

TITLE: Tolerance Study for Isogrid Outer Vacuum Shell For SDC Solenoid
AUTHOR: Ang Lee and Ron Fast
DATE: Dec.2, 1991

INTRODUCTION: This design note contains a tolerance study of 56-mm thick isogrid outer vacuum shell for the SDC solenoid detector. The vacuum shell stability is a function of isogrid geometry¹. The dimension change due to the tolerance may change collapse pressure Pcr. The study starts with a stability equation given by "Iso-grid Design Handbook" by substituting a nominal dimensions (a=6.794", b=0.15", c=0.29", w=1", t=0.11" and S=2.2"), and varying these parameters one at a time to find how the tolerance will effect collapse pressure. Results are shown in Figure 1. It is found that the collapse pressure is most sensitive to the skin thickness, t. Since the skin thickness is so small, the relative change of skin thickness is significant even for a small dimension change. Therefore, tight tolerance is suggested for the skin. It is also interesting to learn from Figure 1 that the Pcr is also more sensitive to c than to b, S, and w. This is due to the fact that most of the inertial moment is provided by the flange and skin. The Table 1 shows the results of calculations where more than one parameter is varied.

Table 1

Nominal dimension	S=2.2"	c=0.29"	b=0.15"	w=1"	t=0.11"	
tolerance (mils)	-10	-10	-10	-10	-10	Pcr=28.41 psi
tolerance (mils)	-5	-5	-5	-5	-5	Pcr=29.39 psi
tolerance (mils)	-0	-10	-10	-10	-10	Pcr=29.37 psi
tolerance (mils)	-0	-5	-10	-10	-10	Pcr=29.61 psi

REFERENCE:

1. "Isogrid Design Handbook", General Dynamics, 1973

Tolerance study for iso-grid shell

for $a=6.794''$, $b=0.15''$, $c=0.29''$, $w=1.0''$, $s=2.2''$

